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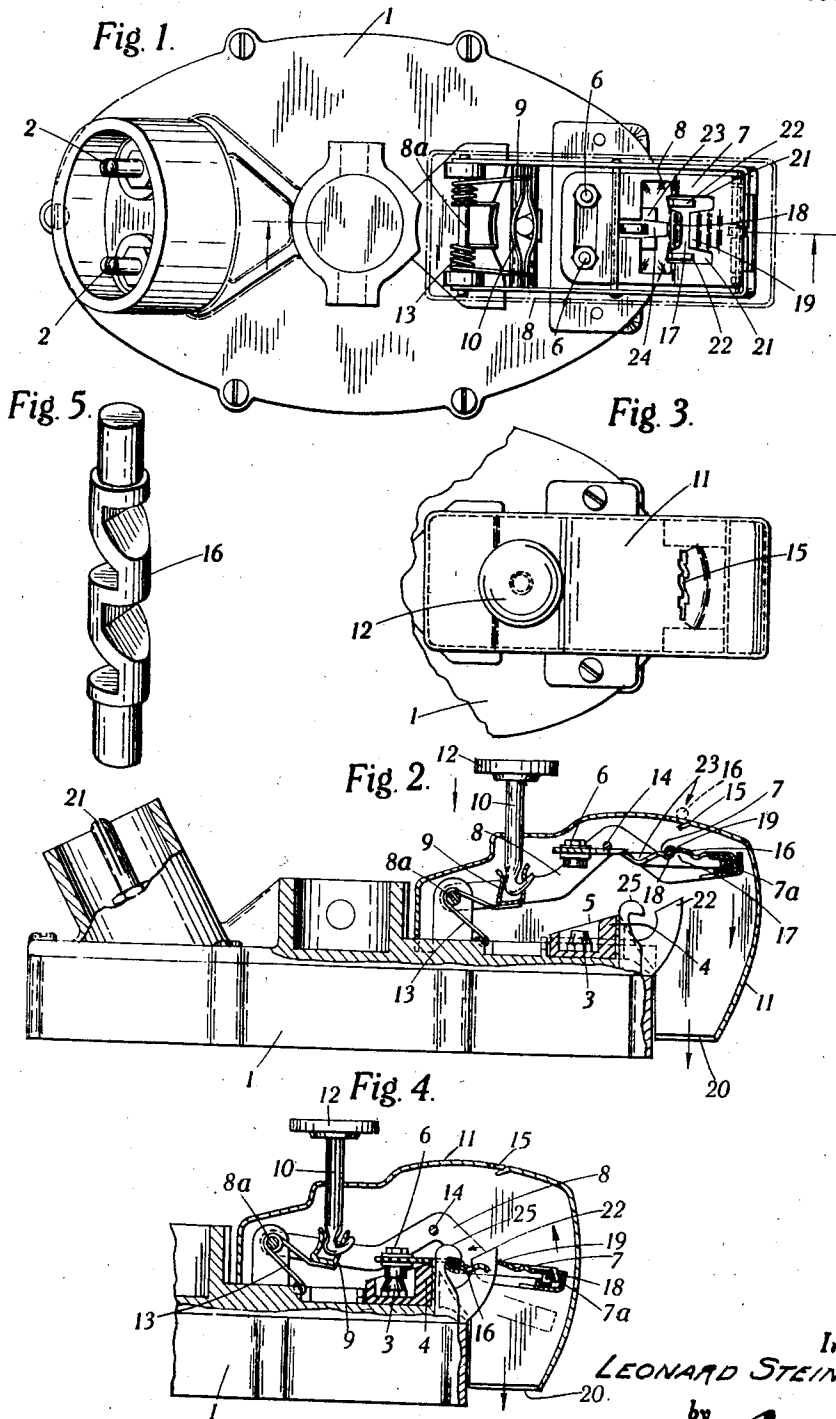
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SWITCH FOR VULCANIZING MACHINES

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2 Sheets-Sheet 1



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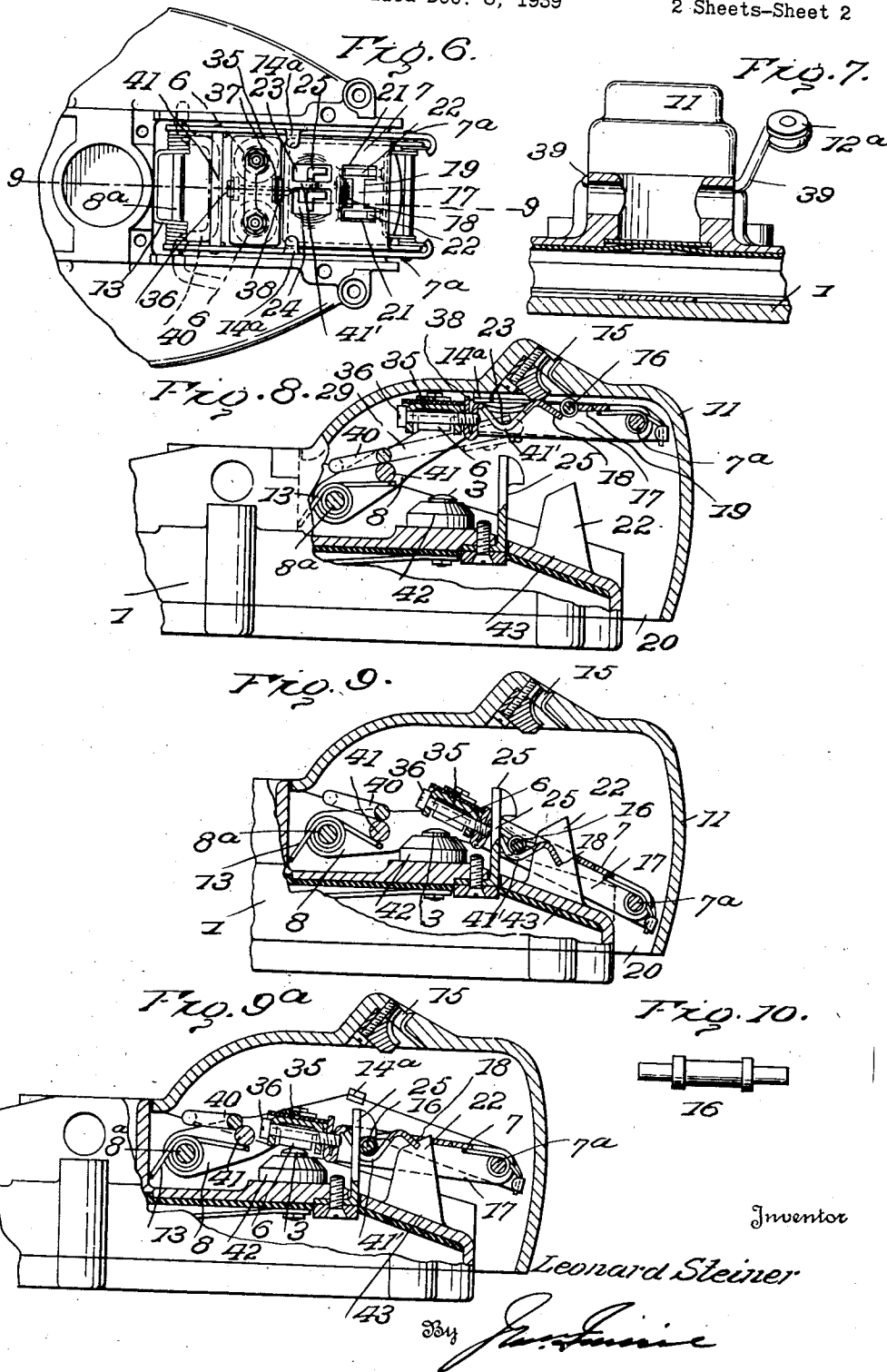
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UNITED STATES PATENT OFFICE

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SWITCH FOR VULCANIZING MACHINES

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23 Claims. (Cl. 200-142)

This invention concerns vulcanizing machines for use in repairing motor vehicle tyres and other rubber or rubberized articles such as fire hose pipes, hot water bottles, and so on, wherein a suitable pressure is applied to a repair patch, while it is heated to such a temperature that adequate "cooking" takes place to ensure proper vulcanization.

The invention more specifically concerns machines of the above kind in which the vulcanizing heat is produced in the pressure member by an electric heating element of which the current supply is controlled by a manually operated switch device which is adapted to be automatically operated to interrupt the supply of current when the pressure member is heated to the requisite temperature for proper vulcanization, owing to the melting of a fusible metal member which is subject to the heat developed by the heating element.

With the known machines, however, it is possible for the operator manually to hold the switch in operation without the aid of the fuse member, with the result that the vulcanizing action is not then subject to automatic control, and the main purpose of this invention is to avoid this possibility and render the heating element completely subject to automatic control. This result is achieved by rendering it impossible to complete the circuit of the element unless the correct fusible element has been inserted into the mechanism of the heating element.

One object of the invention therefore is to provide switch mechanism such that the switch member is operated from the operating member through a mechanical train of parts of which a correct fuse member forms an essential unit, so that in the absence of the fuse member the switch member cannot be operated by the operating member.

In accordance with the invention the switch device controlling the heating element may comprise a pivoted member, preferably in the form of an open frame adapted to be depressed by the operator, a plate pivoted to said member near its free end and extending towards its pivoted end, said plate carrying contact means at its free end, and a fixed hook member which is rendered operative to hold said plate in circuit closing position by a fuse member engaged therewith. Preferably the pivoted member is depressed against the action of spring means and preferably also the pivoted plate does not move into circuit closing position until the piv-

oted member is released and has been returned to its normal position by the spring means.

The fuse member is preferably inserted through a slot of corresponding shape in a fixed cover enclosing the switch mechanism and falls on to the surface of the pivoted plate with its ends projecting across a pair of parallel slots, so that when the pivoted member and arm are depressed a pair of ejector plates enter said slots and cause the fuse member to slide or roll into position across a slot, preferably at the bottom of a depression in the pivoted plate, towards its free end. Towards the end of the movement of the pivoted plate the hook member fixed on the upper plate of the element passes through said slot, and engages over the fuse member. Upon release of the pivoted member its upward movement carries with it the pivoted end of the plate and thus rocks the plate about the fuse member as a fulcrum, thereby depressing its free end until its contact means bridges or makes contact with fixed contact means on the upper plate of the element.

Other constructional features of the invention will appear from the following description and will be hereinafter defined in the claims appended hereto and forming part of this specification.

The invention is illustrated, by way of example, by the accompanying drawings, which show two constructional examples of heating elements embodying the various features of the invention. In the drawings:

Figures 1-5 show one construction of heating element and control switch according to the invention, of which Figure 1 shows the element and switch mechanism in plan view, with the switch cover removed and the switch in open position.

Figure 2 shows the element in side elevation, with the switch mechanism in section and in the open position.

Figure 3 is a partial plan view with the switch cover in position.

Figure 4 is a partial sectional view of the switch mechanism when in the closed position. Figure 5 is a perspective view to an enlarged scale, of a fuse for operating the switch mechanism.

Figures 6-10 show a modified construction of control switch, of which

Figure 6 is a plan view of the switch mechanism in the "off" position, with the operating handle removed.

Figure 7 is a partial end view of the element with the switch casing in position.

Figure 8 is a sectional view of the switch mechanism in the "off" position with the fuse in its first position.

Figure 9 is a sectional view on the line 9-9 of Figure 6, the parts being in position after the operating arm 39 is depressed and the fuse is thrown in position to form a fulcrum to subsequently cause the contacts to engage.

Figure 9^a is a similar view on the same line but showing the parts in position after pressure on the operating arm is released, the fuse acting as a fulcrum to tilt the frame to bring the contacts in engagement.

Figure 10 shows another shape of fuse member which may be employed.

Referring to Figures 1-5 inclusive, the heating and pressure element for a vulcanizing machine comprises an oval casing 1 containing a resistance element connected to the terminal plug pins 2, in series through a pair of fixed contacts 3, carried in spaced relation on the upper plate of the element casing. These contacts 3 are spaced apart on an insulating block 4 and separated by a web 5 of insulating material, the surface of the web and block being sloped so that any piece of metal dropped on to the contacts 3 will slide off and not remain bridging the contacts.

The contacts 3 may be bridged by a pair of bridging contacts 6 carried by a movable contact member 7 pivoted at 7a to the free end of the main switch lever 8, which is pivoted on pivot rod 8a. The lever 8 is built up as an open frame between the side members of which the member 7 is pivoted, and to a cross member 9 of the frame 8 is connected the lower end of a rod 10 which at its upper end projects through a hole in the switch casing 11 and terminates in a pressure button 12. A spring 13 normally holds the switch lever 8 in the upwardly inclined position shown in Figure 2, and a light spring (not shown) also acts between lever 8 and contact member 7, to hold the latter upwardly, as shown in Figure 2, in contact with a cross bar 14 of the frame 8, with the pivoted end of the member 7 beneath a slot 15 in the switch casing 11.

The fuse 16 employed to operate the switch mechanism may be of any selected form such, for example, as the toothed form illustrated by Figure 5. Another convenient form is that illustrated by Figure 10, having a pair of spaced collars on a cylindrical stem. The edges of the slot 15 are suitably shaped to conform with the shape of the fuse and to form a passage which allows the fuse 16 to pass therethrough. After passing through slot 15, the fuse 16 falls on to contact member 7 along a transverse slot 17 defined by a depressed lip 18 and a raised lip 19. The distance between these lips 18 and 19 is such that a fuse of too small a diameter falls through the space between them and out of the opening 20 at the bottom of casing 11 at the end of element 1. At the ends of the slot 17 are a pair of parallel slots 21.

Upon pressure being applied to the button 12 the lever 8 is depressed, and the contact member 7 is lowered at its outer (pivoted) end until a pair of bevelled fingers 22 mounted on the end of element 1, enter the slots 21 and engaging with the ends of the fuse 16, cause it to roll into the depression 23 in the member 7. At the bottom of the depression 23 is a longitudinal slot 24, across which the fuse falls, and upon further

movement of the member 7 a hook 25 on the end of the element 1 enters the slot 24 and engages over the fuse 16.

Up to this moment the contacts 6 are spaced widely from the contacts 3, but upon now releasing the button 12 the spring 13 returns the lever 8 upwardly, and this taking with it the pivoted end of member 7, rocks member 7 about the fuse 16, held beneath hook 25 as a fulcrum, as shown in Figure 4; so that the free end of member 7 is brought downwardly until its contacts 6 are pressed tightly against contacts 3, thereby completing the circuit of the resistance element.

The hook 25 forms part of a metal member extending within the casing of element 1 and becomes heated up as the element develops heat. When the element 1 is sufficiently hot for vulcanizing, the hook 25 reaches such a temperature that the fuse 16, by reason of its composition and the heat transmitted to it by conduction from the hook 25, disintegrates and breaks, whereupon the fulcrum of member 7 is removed and the member is swung upwardly by its spring into the position shown in Figure 2, thereby separating contacts 6 from contacts 3 and breaking the circuit of the heating element. The broken parts of the fuse 16 fall away through the opening 20 of casing 11, the slot 24 being somewhat enlarged transversely, where the fuse 16 rests across it, to facilitate this.

As will be appreciated from the foregoing, the moving contacts 6 possess a considerable arc of movement, in relation to fixed contacts 3, giving a large break between the contacts, thus decreasing or eliminating the risk of arcing between the contacts and reducing the need for cleaning and renewing them. Instead of employing pairs of contacts 3 and 6 for giving a double break in the circuit of the heating resistance, which is preferred, particularly for operation with direct current, I may obviously employ single contacts by taking the circuit through the contact member 7 and switch lever 8 to one of the plug pins 2, in which case, of course, these parts must be insulated from the element 1.

It will be understood that, in order to ensure that the switch mechanism can only be operated by the correct fuse, designed to disintegrate at the proper temperature according to the composition of the fusible alloy of which it is made, the fuses 16 for operating the switch mechanism are made of a specific shape and size corresponding to that of the insertion slot 15 in the casing of the switch mechanism, whilst the transverse slot 17 in contact member 7 along which the fuse falls after passing through entry slot 14 is too small in width to permit the correct fuse 16 to drop through, but will allow a fuse of too small a maximum diameter to fall through the slot 17 and out of the casing 11 through opening 20, so that on depressing the operating button 12, the switch mechanism will not operate. The correct fuse will therefore constitute a kind of key for operating the switch mechanism, which cannot be operated by an incorrect key, whereby incorrect or unauthorized use of the heating element of the vulcanizing machine is prevented.

In the modified construction illustrated by Figures 6-10, the movable bridging contacts 6 are carried by a platform 35 which is mounted by means of a bolt 36 on the end of the contact carrying member 7, so as to swivel or tilt in the transverse direction. By this means the contacts 6 are self-adjusting in relation to the fixed

contacts 3, whereby equally good contact is ensured at all times between both pairs of contacts. The tilting movement of the platform 35 is limited by a cut away portion 37 in its edge which is engaged by a stamped up lug 38 on the end of contact carrying member 7.

Instead of operating the frame 8 by the plunger 10, 12, it is in this case operated by an external angularly movable arm 39 which passes into the casing 11 and is bent to form a crank portion 40 which bears on the cross rod 41 of frame 8.

Another important feature of difference lies in the retaining and heat conducting hook 25, which in this construction is bifurcated or slotted to allow the entry therein of a steel or other cutting pin or strip 41' spanning the opening 24 and running beneath the fusible member 16 resting in the recess 23 in contact carrying member 7. This cutting pin or strip 41' applies a bending pressure to the fuse 16 between the two portions of the hook 25, which apply the heat to the fuse member. By this means a more sudden breakage or disintegration of the fuse takes place when the desired temperature of the heating element is reached, so that more accurate temperature regulation results.

The cross rod 14 of lever frame 8 is replaced by stop lugs 14a, whilst the fixed contacts 3 are mounted in separate insulating bushes 42 of ample size. To facilitate falling away of the disintegrated parts of the fuse 16 after it has broken at the desired temperature the end portion of the element base on which the ejector fingers 22 are mounted is sloped down at 43.

The invention is not limited to the specific constructions of switch mechanism illustrated, since they are only two examples of the many which may be devised in accordance with the invention as hereinafter defined in the appended claims.

What I claim is:

1. A switch for the purpose described, including fixed contacts, movable contacts adapted to engage said fixed contacts, a movable carrier on which said movable contacts are mounted, and a train of mechanism for moving said carrier so that said movable contacts engage said fixed contacts, a casing inclosing said carrier and contacts and having an insertion slot, and said train of mechanism including a manually operated actuating member outside said casing, and being rendered complete by a fusible member inserted through said slot.

2. A switch for the purpose described, including a manually operated control switching means, and a train of mechanism for moving said switching means into circuit closed position, said train of mechanism including a fusible element inserted manually into operative position, said fusible element forming a circuit-conducting member, disintegration of which breaks down the train of mechanism and causes automatic opening of the switching means.

3. A switch for the purpose described including manually closed control switching means adapted to be operated through a train of mechanism one circuit-conducting element of which is of a fusible nature, and means for transferring heat to the fusible member, disintegration of said fusible element by the heat applied thereto causing automatic opening of the switching means.

4. A construction as defined in claim 2 including a casing enclosing the switch operating mechanism, said casing having an insertion slot for

the fusible element, of a predetermined shape to which the fusible element conforms.

5. A construction as defined in claim 2 including a casing enclosing the switch operating mechanism, said casing having an insertion slot, for the fusible element, of a predetermined shape to which the fusible element conforms, said mechanism including a contact carrying member which is rockable about a fulcrum into circuit closing position, and said fulcrum being formed by the fusible element inserted into said casing through said slot.

6. A switch for use in a heating element for an electric vulcanizing machine of the type, including a box like pressure member, said switch including a casing mounted on said pressure member, having an insertion slot for a fusible element, switch mechanism in said casing, means within said casing operable by means external to said casing, for receiving a fusible element inserted through the casing slot, a hook member to be engaged by the fusible element, and adapted to receive heat, said mechanism including a contact carrying member which is rockable into circuit closing position about a fulcrum formed by said fusible element engaged with said hook.

7. A switch for use in a heating element for an electric vulcanizing machine, of the type including, fixed contacts, said switch including a movable spring controlled switch arm carrying contacts movable into contact with said fixed contacts; manually operated means for depressing said switch arm to bring said movable contacts in proximity to said fixed contacts, and means adapted, on release of said manually operated means for movement by its spring control, to bring said movable contacts into contact with said fixed contacts, said means including a fulcrum formed by a fusible member, disintegration of said fusible member simultaneously releasing said switch arm and permitting separation of the movable and fixed contacts.

8. A switch for use in a heating element for an electric vulcanizing machine, of the type including, a hollow base, fixed contacts, said switch including a movable spring controlled switch arm carrying contacts movable into contact with the fixed contacts, a casing enclosing said switch arm and contacts; manually operated means outside said casing extending into said casing and adapted to depress said switch arm to bring said movable contacts in proximity to said fixed contacts, a slot in said casing for the reception of a correspondingly shaped fusible element, means in said casing actuated by movement of said switch arm for transferring a fusible element inserted through said slot, a hook member to be engaged by said fusible element, and means adapted, on manual release of said switch arm for movement by its spring control, to bring said movable contacts into contact with said fixed contacts, said means including as a fulcrum element thereof a fusible member engaged with said hook member, whereby said fusible member maintains said contacts in engagement until its disintegration by heat permits separation of said contacts and return of said switch arm to "off" position.

9. A switch for use in a heating element for an electric vulcanizing machine of the type including a hollow base, fixed contacts, said switch including a movable spring controlled switch arm carrying contacts movable into contact with the fixed contacts, a casing enclosing said switch arm and contacts, a slot in said casing of predetermined shape and size, a platform carried

by said switch arm having a slot beneath the casing slot which permits the passage there-through of a fusible member inserted through said casing slot and having a maximum diameter less than a predetermined size equal to the maximum width of said casing slot; manually operated means outside said casing extending into said casing and adapted to depress said switch arm to bring said movable contacts in proximity to said fixed contacts, means in said casing actuated by movement of said switch arm for transferring a fusible member inserted through said slot, a hook member to be engaged by said fusible element, and means adapted, on manual release of said switch arm for movement by its spring control, to bring said movable contacts into contact with said fixed contacts, said means including as a fulcrum element thereof an inserted fusible member engaged with said hook member, whereby said fusible member maintains said contacts in engagement until its disintegration permits separation of said contacts and return of said switch arm to "off" position.

10. A switch for use in a heating element for an electric vulcanizing machine of the type including a hollow base member, said switch including a slotted casing attached to said base member and enclosing said switch device, a manually operated member external to said casing adapted to actuate the switch mechanism; said switch mechanism comprising a spring controlled frame pivoted at one end, a spring controlled platform pivoted at the free end of said frame and extending inwardly therefrom, said platform having a transverse slot to receive and retain a fusible element inserted into said casing, if of sufficient dimensions, ejector fingers on said base member adapted to eject said fusible element from said slot on downward movement of said frame and platform, and a recess in said platform to receive said element when ejected from said slot, and a hole in said recess, a hook member upstanding from said base and in conductive connection with the heated interior of said base, said hook member being located to enter said hole in said platform when lowered and to engage over said fusible element lying in said recess, fixed contacts carried by said base member, and movable bridging contacts carried by said platform, actuation of the control switch operating member producing downward movement of said frame against its spring control means and engagement of the platform over said hook member, said spring control means, on release of said operating member raising said frame, so that its free end rocks said platform about said fusible element and thereby depresses the movable contacts against the fixed contacts.

11. A construction as defined in claim 2, including an angularly movable spring controlled switch arm, a transversely rocking platform pivotally mounted on said arm, contact members carried by said platform, and co-operating fixed contacts, said contact members and fixed contacts forming part of the switching means.

12. A construction as defined in claim 2, including an angularly movable spring controlled switch arm, a transversely rocking platform pivotally mounted on said arm, means for limiting the rocking movement of said platform, contact members carried by said platform, and co-operating fixed contacts, said contact members and fixed contacts forming part of the switching means.

13. A construction as defined in claim 2, in-

cluding an angularly movable spring controlled switch arm, a casing enclosing said train of mechanism and said switch arm, and operating means for said switch arm extending outside said casing.

14. A construction as defined in claim 2, including an angularly movable spring controlled switch arm, a casing enclosing said train of mechanism and said switch arm, and an operating lever external to said casing but journaled therein for angular movement, said lever having a cranked portion within said casing, bearing on said switch arm.

15. A construction as defined in claim 2, including, as elements of said train of mechanism, an angularly movable member carrying movable contacts, a hook member in thermal connection with said heating winding, with which a fusible member manually inserted into the mechanism is engaged, said fusible member then acting as a fulcrum for rocking movement of said angularly movable member, and fixed contacts, rocking movement of said angularly movable member bringing said movable contacts into contact with said fixed contacts, said movable and fixed contacts forming part of the switching means.

16. A construction as defined in claim 2, including, as elements of said train of mechanism, an angularly movable member carrying movable contacts, an opening in said member, a cutting strip extending across said opening, a slotted hook member, insertion of a fusible member in said casing resulting in its location in position across said opening and cutting strip, and movement of said angularly moving member resulting in said opening passing over said hook member and said strip entering the slot in said hook member, whereupon said hook member engages over the fusible member, said fusible member then acting as a fulcrum for rocking movement of said angularly movable member, and fixed contacts, said movable and fixed contacts forming part of the switching means, rocking movement of said angularly movable member bringing said movable contacts into contact with said fixed contacts.

17. A switch for use in a heating element for an electric vulcanizing machine of the type including a pair of fixed contacts, said switch including a pair of co-operating movable contacts carried by a spring controlled link work, a casing enclosing said contacts and link work having an insertion opening for a fusible metal element, means external to said casing for actuating said link work within said casing without causing contact of said fixed and movable contacts, actuation of said link work locating a fusible member inserted in said casing into a fulcrum forming position, and release of said actuating means allowing the link work to move under the action of its spring control to bring said movable contacts into contact with said fixed contacts, and heat conductive means for the fusible member, whereby under predetermined temperature said fusible member disintegrates, and releases said link work for movement into "off" position in which said movable contacts are separated from said fixed contacts.

18. A switch for use in connection with an electrical heating vulcanizing machine including manually operating means, a circuit closing contact carried by and movable with the operating means, a fuse removably carried by the contact, means for locking the fuse in a predetermined position on depression of the operating means,

and means for utilizing the fuse as a fulcrum to cause the movable contact to complete the circuit.

19. A switch for use in connection with an electrical heating vulcanizing machine including manual operating means, a contact element carried by the operating means, means on the element to receive and support a fuse, means below the element to receive and lock the fuse and thereby the element on actuation of the operating means, and means to utilize the fuse as a fulcrum on the release of the operating means to cause the element to close the circuit through the fuse.

20. A construction as defined in claim 19 including a casing within which the operating means and contact element are mounted, and an opening in the casing through which a fuse may be delivered to a predetermined position on the contact element.

21. A construction as defined in claim 19 including a casing within which the operating means and contact element are mounted, and an opening in the casing through which a fuse may be delivered to a predetermined position on the contact element, means in the casing to shift the fuse from the initial to the operative position in the actuation of the operating means, means to engage and lock the fuse to provide a fulcrum for the contact member, said locking means on

rupture of the fuse permitting the contact member to move to open circuiting position.

22. A switching means for the purpose described including a casing, fixed contacts therein, a carrier movable in the casing, contacts on the carrier for cooperation with the fixed contacts, a fuse element having annular enlargements, the casing being formed with an opening complementary to the form of the fuse to permit the passage of the fuse therethrough, the carrier being formed to receive the annular enlargements and support the delivered fuse, locking element, means ejecting the supported fuse to the locking means for holding the carrier in position to cause the contacts thereon to engage the fixed contacts solely through said fuse element, whereby heat or any disruption of the fuse element releases the carrier and cooperating contact engagement.

23. A switching means including contact members movably open and adapted to be locked in contact relation solely through a rupturable fuse, including a casing formed with a fuse-receiving opening, a fuse, said fuse and opening being of complementary non-regular form, and means for utilizing the fuse passing through said opening as a switch-locking means, said means being receptive to and supporting only the particular fuse capable of being passed through said opening.

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